**IN MEMORIAM**

# John M. Buchanan (1917–2007)

Our close friend and colleague, Professor John M. Buchanan, of Massachusetts Institute of Technology, Cambridge, Massachusetts, passed away on June 25, 2007, in Lexington, Massachusetts. He was 89. Buchanan (he referred to himself as Jack) devoted his life and dedicated service to MIT and to his profession. He joined the MIT faculty in 1953 as Professor of Biology and as director of the newly established Division of Biochemistry. He soon recruited a core group of both young and senior faculty to the department, including Gene Brown, Vernon Ingram, Salvador Luria, Paul Schimmel, Phil Robbins, and Lisa Steiner. Growing from this nucleus, the Biology Department and the Biochemistry Division soon gained a reputation of being one of the outstanding programs in the country. Jack Buchanan was also a magnet to attract other leading scientists to MIT, including Cyrus Levinthal, Maurice Fox, and Alexander Rich. These key appointments increased the MIT Biology Department's international reputation rapidly. In his autobiography, the late MIT President James Killian observed that bringing Buchanan to MIT was among the most important recruitments (and most expensive, with six additional appointments) during his tenure as it directly led to raising the Biochemistry program to the top ranks in the field very quickly.

Buchanan took his undergraduate degree in Chemistry at DePauw University in 1938 and earned a Master's in Biological Chemistry at the University of Michigan in 1939. He moved to Harvard Medical School for his Ph.D. work under A. Baird Hastings, where his research contributed to understanding the gluconeogenic pathway from lactic acid. This was one of the pioneering studies on biosynthetic pathways using isotopically labeled precursors—in this case, the extremely short half-life form of carbon, C-11. After completing his Ph.D. in 1943, he joined the faculty in Physiological Chemistry at the University of Pennsylvania Medical School, rising to full professor by the time he left in 1953. Buchanan was awarded a Medical Research Council Fellowship between 1946 and 1948, which he used to work with Hugo Theorell at the Nobel Institute in Stockholm. This was a singularly successful period in Buchanan's career, in which he not only gained expertise in protein and enzyme chemistry but, probably more importantly, met Elsa Nielsen who would in due time become Elsa Buchanan, his wife and inseparable companion of 57 years.

At the University of Pennsylvania, Buchanan and his colleagues embarked on a study of the biosynthesis of purines, compounds of great importance as components of nucleotides and nucleic acids. Initially, the precursors of the various positions of the purine ring were determined using isotopic labeling methods in vivo, using pigeons, which excrete the purine uric acid in large


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amounts. His subsequent elucidation of purine nucleotide biosynthesis de novo, begun at Pennsylvania and completed at MIT, stands as a classic example of unraveling metabolic pathways by a combination of labeling and enzymological dissection of the individual steps. His detailed study of purine biosynthesis led the development of a large number of chemotherapy anticancer drugs that have been widely used over the last few decades.

As Buchanan's group grew at MIT, his research interests branched in several new directions. Arising from the purine work and its implication of folic acid cofactors in one-carbon transfer reactions, a subset of his group worked out key steps in the biosynthesis of the methyl group of methionine. Another group investigated the details of nucleotide and nucleic acid synthesis in bacteriophage T4-infected *E. coli* cells, including the means by which the phage subverts the cell's normal DNA synthesis. Continuing his focus on nucleotide metabolism, Buchanan's laboratory found that up-regulation of DNA synthesis after fertilization of *Arbacia* eggs could be traced to a dramatic increase in the synthesis of ribonucleotide reductase, an essential enzyme for the formation of deoxyribonucleotide precursors of DNA. Interest in regulation of eukaryotic cell growth and the cell cycle was extended in enzymological studies on the transformation of fibroblasts by proteolytic enzymes and oncogenic viruses.

Buchanan held very high scientific standards both for himself and for the entire scientific community. His research is not only original, but also rigorous. Over his scientific career, Jack was recognized by many honors. He was the first recipient of the John and Dorothy Wilson Professorship at MIT, a title he continuously held until his retirement in 1988. Among many of his honors, he received the American Chemical Society's Eli Lilly Award in Biochemistry in 1951 and was named the Harvey Society Lecturer in 1958. He was elected to the American Academy of Arts and Sciences in 1953 and to the National Academy of Sciences in 1962. He holds honorary doctorates from the University of Michigan, and from his alma mater, DePauw University.

John Buchanan mentored a long list of undergraduate and graduate students and postdoctoral associates during his prolific scientific career. He had great influence on many of his scientific colleagues worldwide. In addition to his immeasurable contribution to their professional careers, Buchanan has enriched their lives through his trusted friendship and wise council, as he has the lives of his colleagues at MIT and elsewhere. MIT has endowed an annual John M. Buchanan Lectureship and invites leading scientists worldwide to honor him. Jack will be greatly missed by his former students, postdocs, colleagues, and friends. His scientific legacy will endure at MIT and elsewhere for years to come. He is survived by his wife, Elsa, of 57 years; two sons, Steve and Peter; and two daughters, Claire and Lisa; as well as many grandchildren.

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